

PN G068.1+11.0: A young pre-cataclysmic variable with an extremely hot primary

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Abstract

© 2016, Pleiades Publishing, Ltd. An analysis of spectroscopic and photometric data for the young pre-cataclysmic variable (PCV) PN G068.1+11.0, which passed through its common-envelope stage relatively recently, is presented. The spectroscopic and photometric data were obtained with the 6-m telescope and Zeiss-1000 telescope of the Special Astrophysical Observatory. The light curves show sinusoidal brightness variations with the orbital-period time scale and brightness-variation amplitudes of $\Delta m = 1.m41$, $1.m62$, and $1.m57$ in the B, V, and R bands, respectively. The system's spectrum exhibits weak H I ($H\beta$ – $H\delta$) and He II $\lambda\lambda 4541$, 4686 , 5411 Å absorption lines during the phases of minimum brightness, as well as H I, He II, C III, C IV, N III, and O II emission lines whose intensity variations are synchronized with variations of the integrated brightness of the system. The emission-line formation in the spectra can be fully explained by the effects of fluorescence of the ultraviolet light from the primary at the surface of the cool star. All the characteristics of the optical light of PN G068.1+11.0 confirm that it is a young PCV containing sdO subdwarf. The radial velocities were measured from a blend of lines of moderately light elements, C III+N III $\lambda 4640$ Å, which is formed at the surface of the secondary due to reflection effects. The ephemeris of the system has been improved through a joint analysis of the radial-velocity curves and light curves of pre-cataclysmic variable, using modelling of the reflection effects. The fundamental parameters of PN G068.1+11.0 have been determined using two evolutionary tracks for planetary-nebula nuclei of different masses ($0.7 M_{\odot}$ and $0.78 M_{\odot}$). The model spectra for the system and a comparison with the observations demonstrate the possibility of refining the components' effective temperatures if the quality of the spectra used is improved.

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